

CALIFORNIA ELECTRICITY GENERATION AND TRANSMISSION INTERCONNECTION NEEDS UNDER ALTERNATIVE SCENARIOS

Assessment of Resources, Demand, Need for Transmission Interconnections, Policy Issues and Recommendations for Long Term Transmission Planning

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Electric Power Group

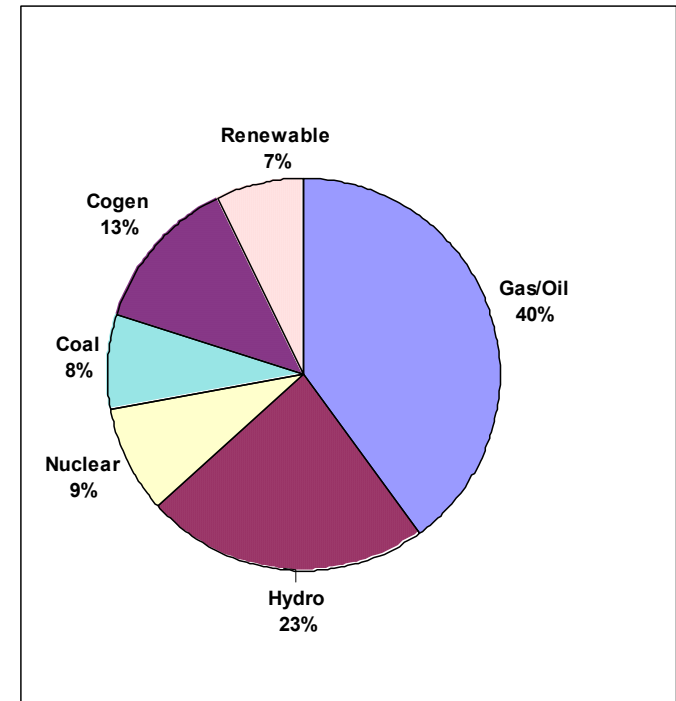
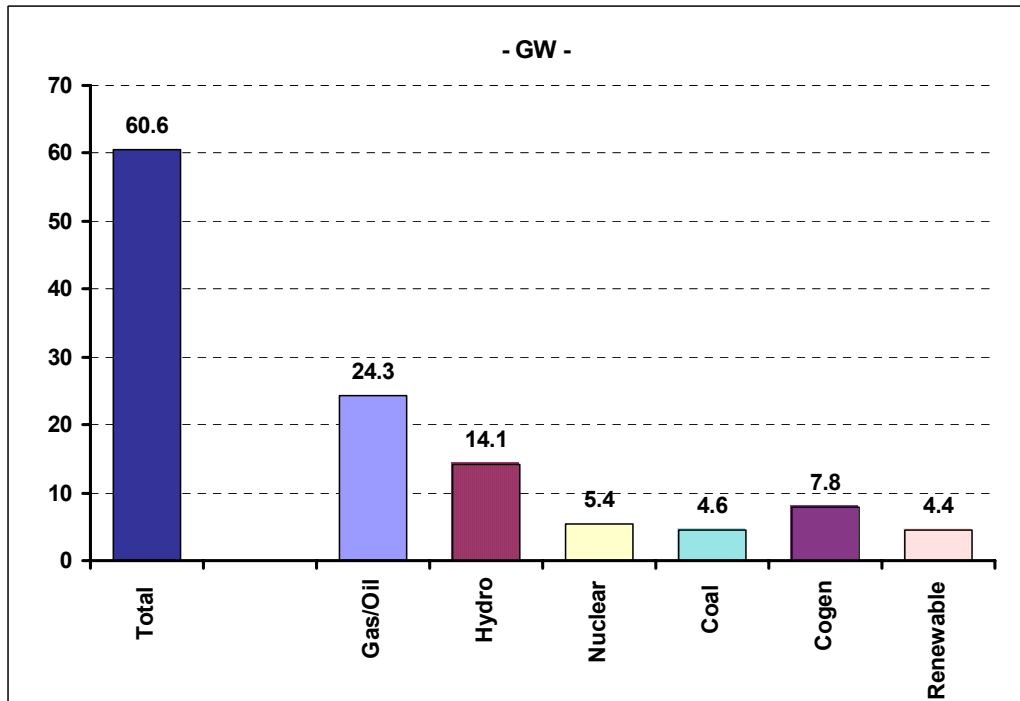
Overview

- Assess California's electricity needs under alternative scenarios for the year 2030.
- Analyze need for new electric supplies to power California's economy in 2030.
- Evaluate alternative scenarios – higher renewables, lower demand, and higher imports.
- Assess need for new transmission interconnections.
- Outline policy issues and recommendations for planning California's future transmission interconnections.

California's Electricity Needs in 2030

- Population growth to 53 million from 31 million in 1995
- Electricity peak demand growth to 80 GW from 52 GW in 2002 – 1.5% long term peak demand growth
- Summer electricity capacity requirements of 92 GW assuming a 15% reserve margin
- Energy requirements grow to 400 BkWh from 262 BkWh in 2003

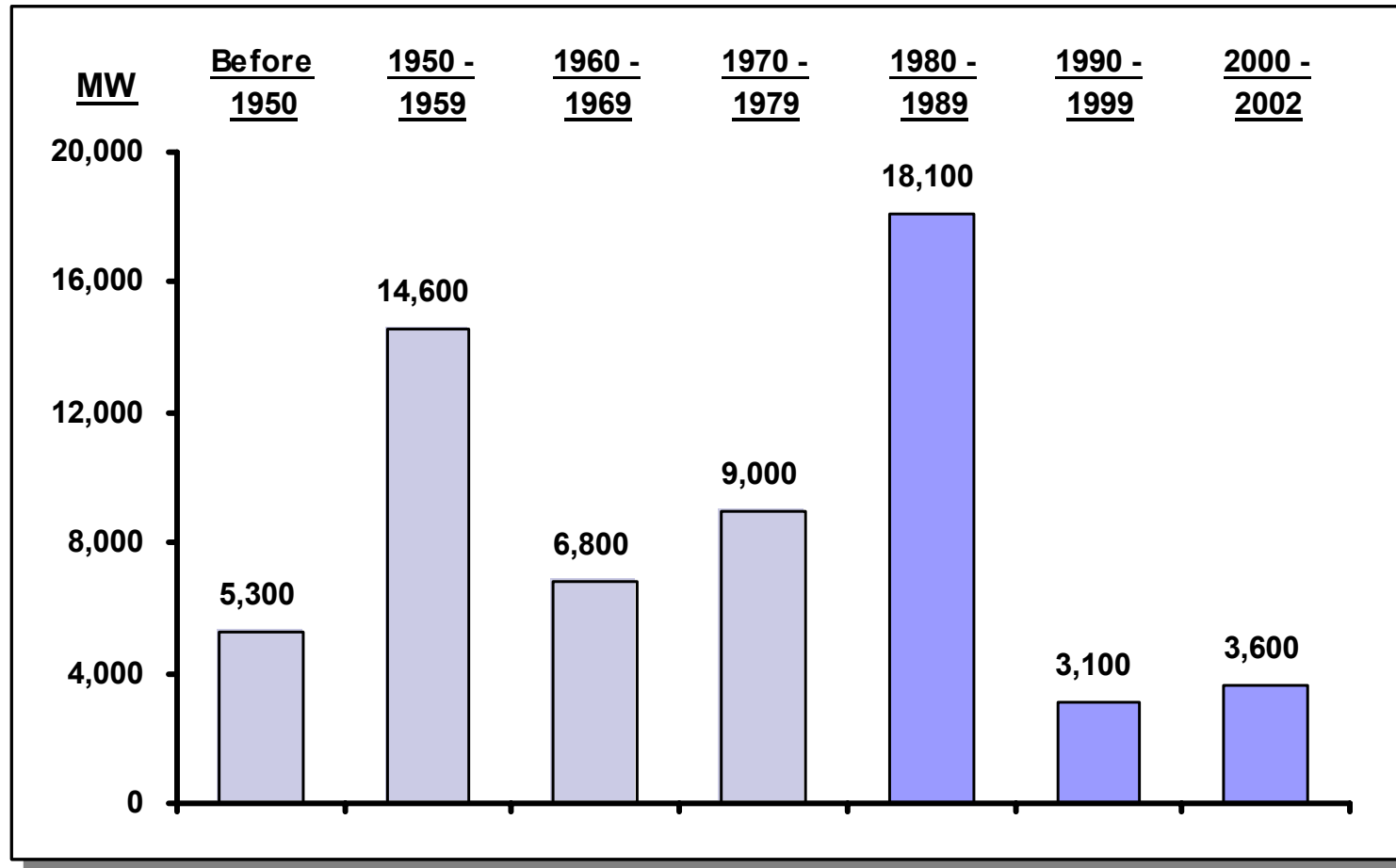
Existing Generation Resources Available to Serve California's Peak Demand (1/1/03)



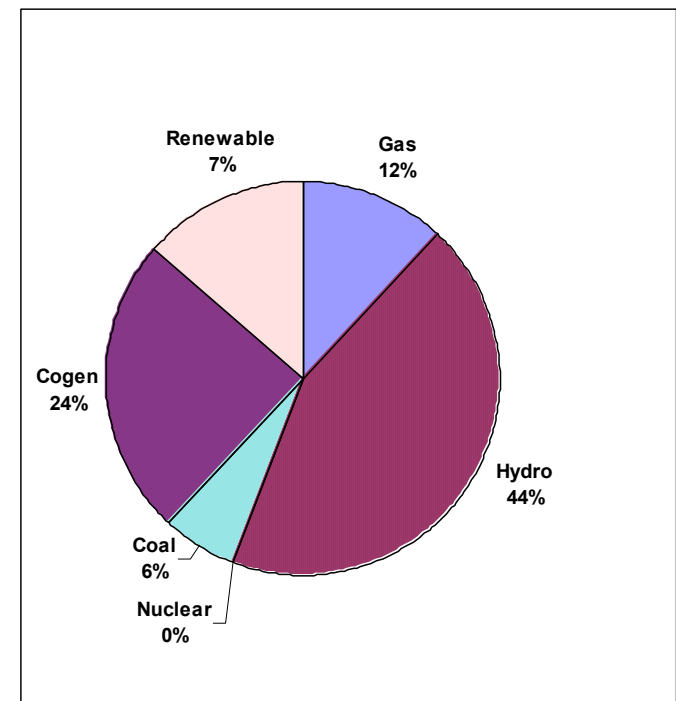
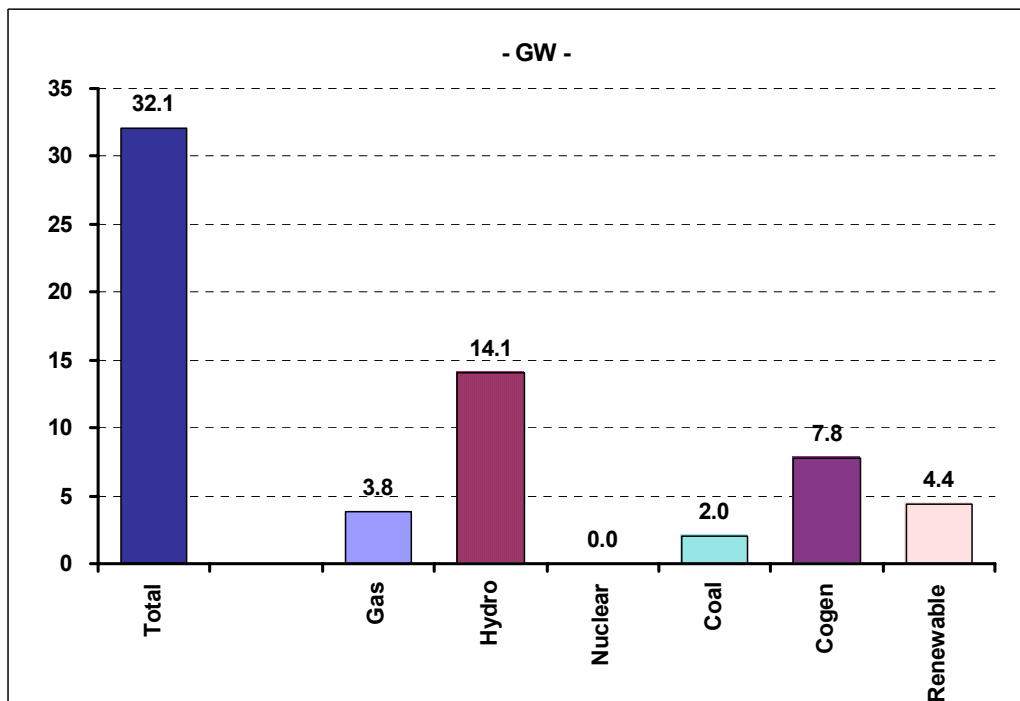
Source: CEC California Power Plants Database (1/17/2001) and WECC Proposed Generation Database (8/8/2003)

Age Distribution of Existing Power Plants Serving California

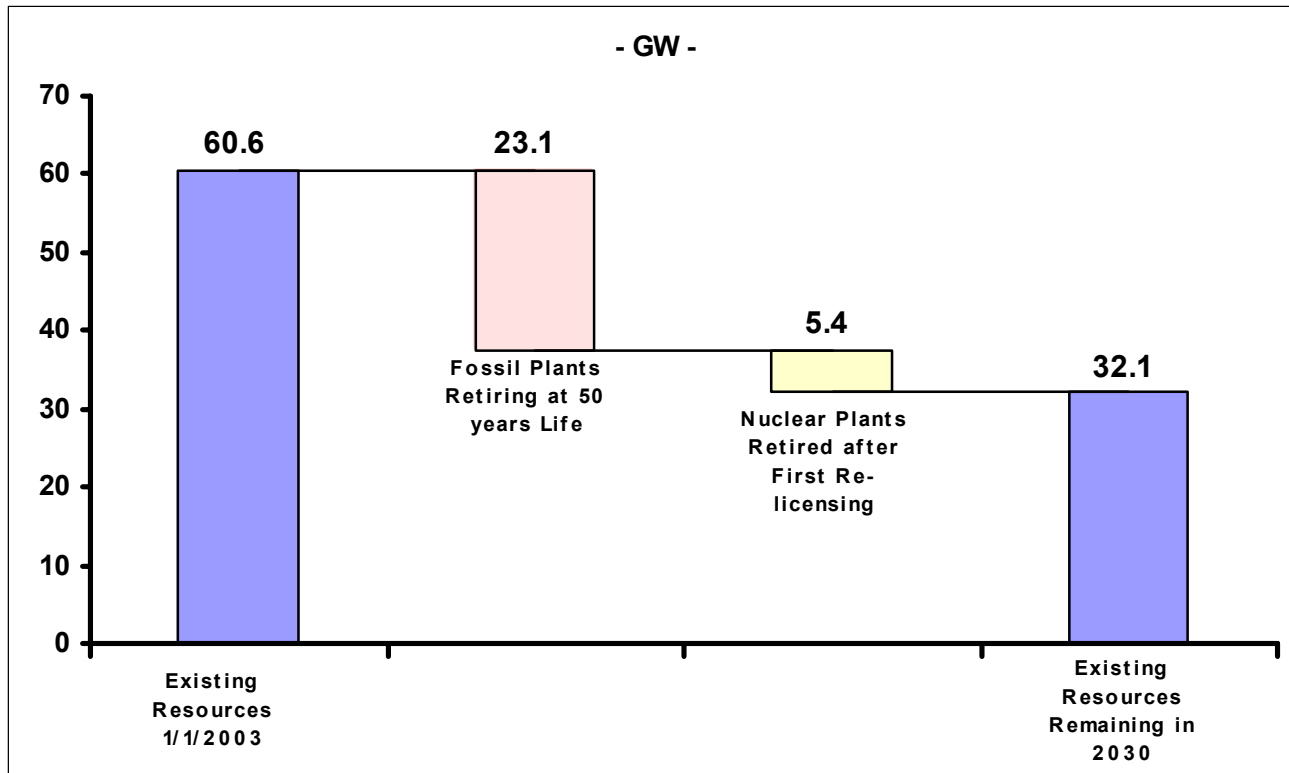
(Including Out of State Coal and Nuclear Plants Owned by California Utilities)



Resources Remaining after Retirement of Fossil Plants at 50 Years and Nuclear Plant Retirements

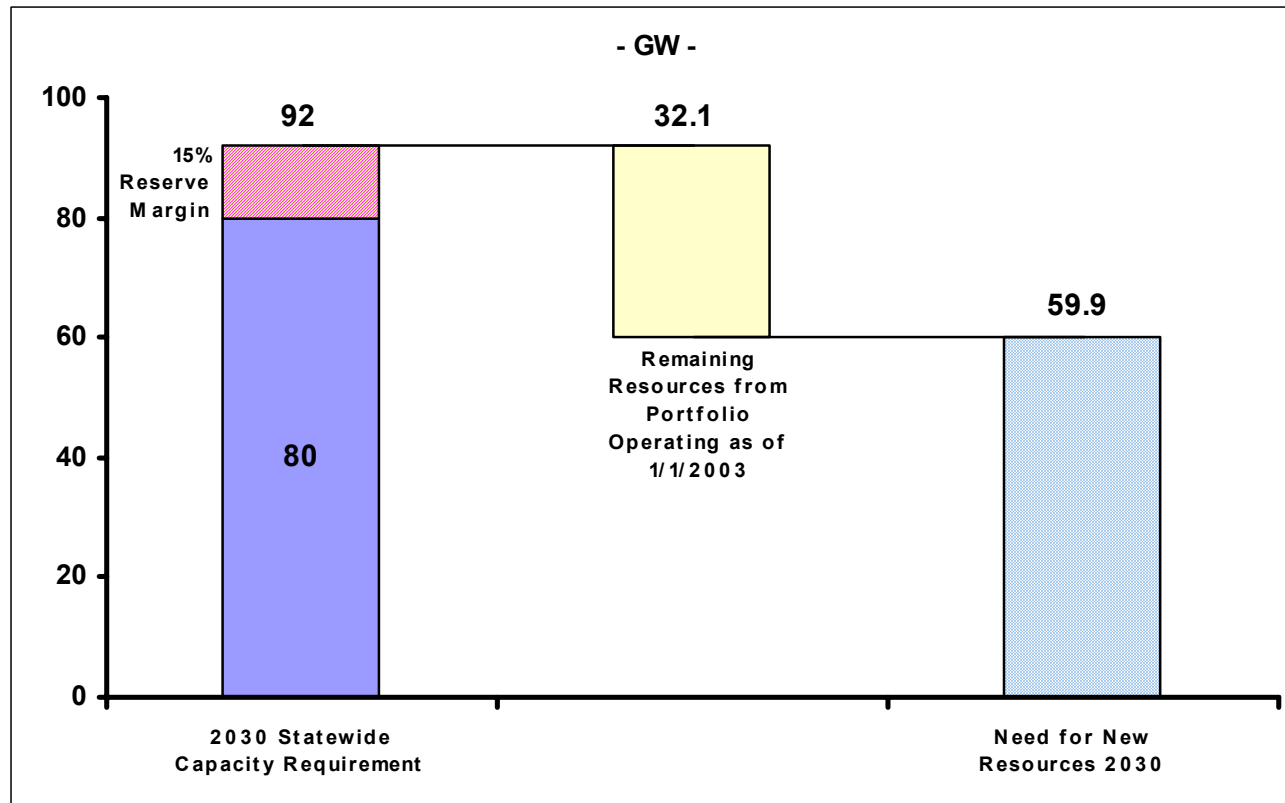


Remaining Capacity in 2030 From the Current Portfolio



Source: CEC-Power Plants in California Report (2/21/2003) and WECC Proposed Generation Database (8/8/2003)

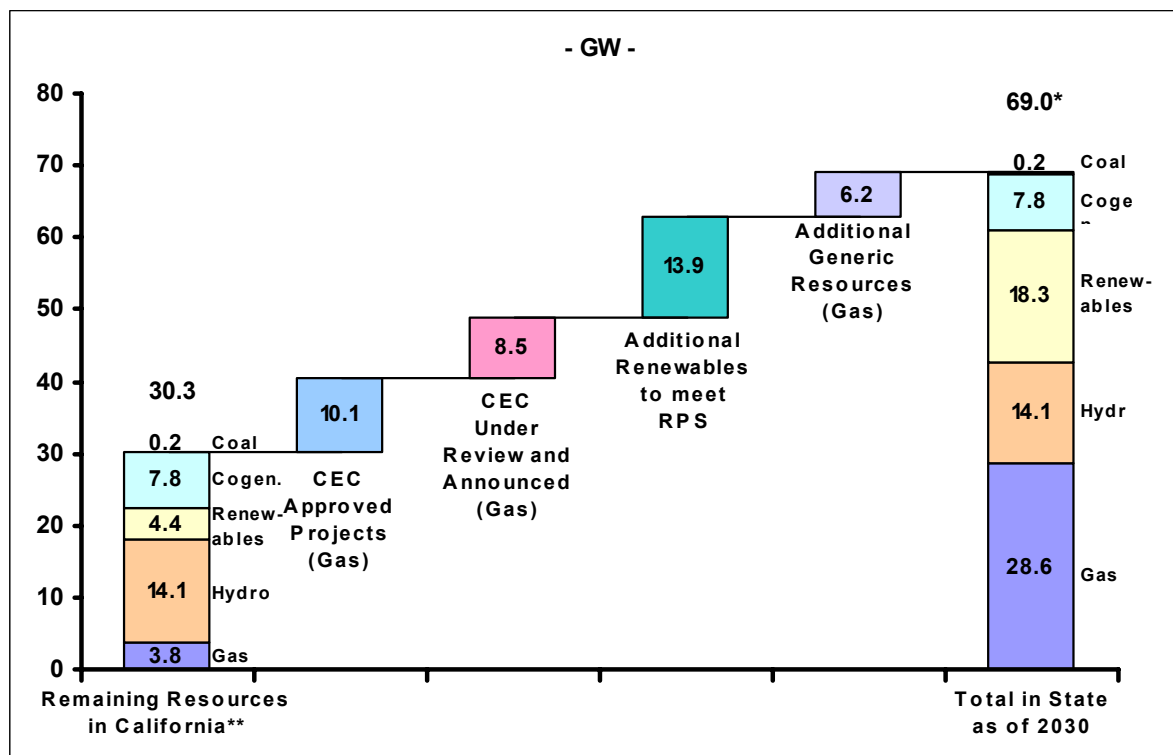
Need for New Resources During 2003- 2030



2030 Base Case Scenario Summary

- Peak demand growth to 80 GW -- 1.5% long term growth
- Capacity requirements of 92 GW with 15% reserve margin
- Fossil plants over 50 years retired -- 23.1 GW
- Nuclear plants retired after first relicensing -- 5.4 GW
- Remaining capacity from current portfolio -- 32.1 GW
- New capacity needed – 59.9 GW
- Renewables supply 20% of energy needs
- 25% or 23 GW of total capacity needs satisfied by imports as at present and 69 GW by in-state resources
- Transmission interconnections required total 26.5 GW assuming 15% reserve margin

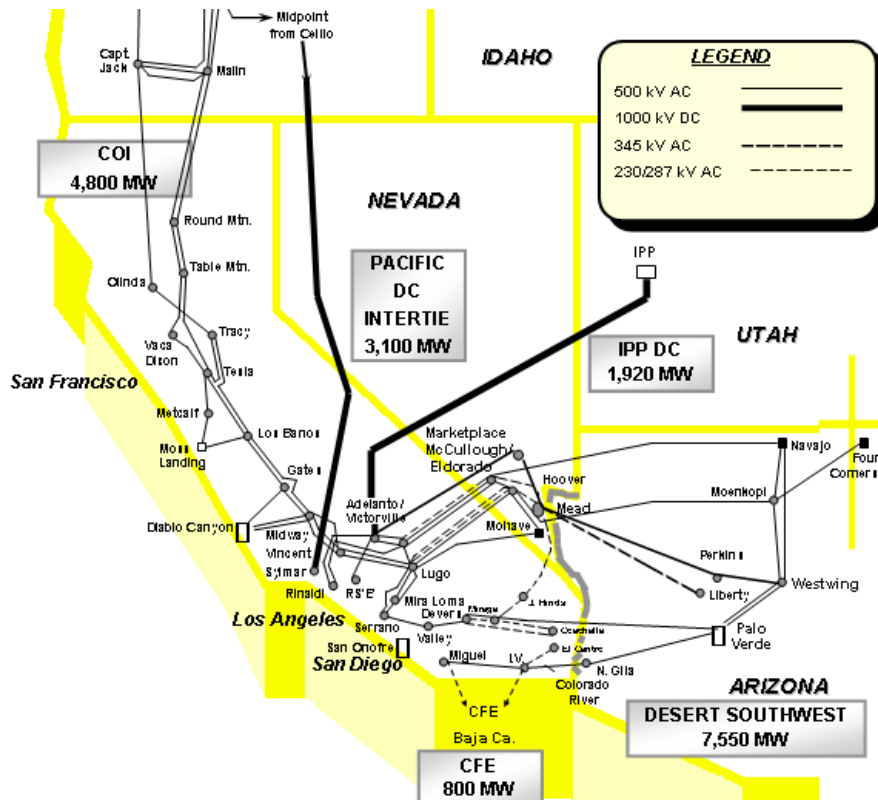
California Generation Resource Outlook for 2030



* 69 GW equals 75% of the total capacity requirement of 92 GW

** Excluding out of state coal projects, such as the Intermountain Power Project

California's 18,170 MW (18.2GW) of EHV Transmission Interconnections



| California Transmission System (MW) | | Transfer Capability |
|-------------------------------------|-----------------|---------------------|
| Pacific Northwest | AC Intertie | 4,800 |
| | DC Intertie | 3,100 |
| Utah | Inter-mountain | 1,920 |
| Desert Southwest | Northern System | 4,727 |
| | Southern System | 2,823 |
| Mexico | Baja Region | 800 |
| Total | | 18,170 |

Options Under Discussion to Expand Transmission Interconnections

- | | |
|---|-----------------|
| ■ Devers-Palo Verde No. 2 | ■ 1.4 GW |
| ■ Expand Interconnections with Mexico (Baja Region) | ■ 0.8 GW |
| ■ Increase Capacity to Utah-Wyoming | ■ <u>2.0 GW</u> |
| | 4.2 GW |

California's Current and Potential Future Transmission Interconnections

| Intertie Capacity (GW) | Current | Expansion Options under Discussion | Future Expansion Options | Total by 2030 |
|------------------------|---------|------------------------------------|--------------------------|---------------|
| Pacific Northwest | 7.9 | - | - | 7.9 |
| Inland Northwest | 1.9 | 2.0 | 2.0 | 5.9 |
| Desert Southwest | 7.6 | 1.4 | 1.3 | 10.3 |
| Mexico | 0.8 | 0.8 | 0.8 | 2.4 |
| Total | 18.2 | 4.2 | 4.1 | 26.5 |

Scenario Description

- Base Case
 - Peak demand growth @ 1.5%
 - Renewables @ 20%
 - Imports @ 25%
- Higher Renewables
 - Increase renewables to 33%
- Low Load Growth
 - Reduce demand growth to 1%/year
 - Peak demand in 2030 @ 73.5 GW
- Higher Imports
 - Increase imports to 30%

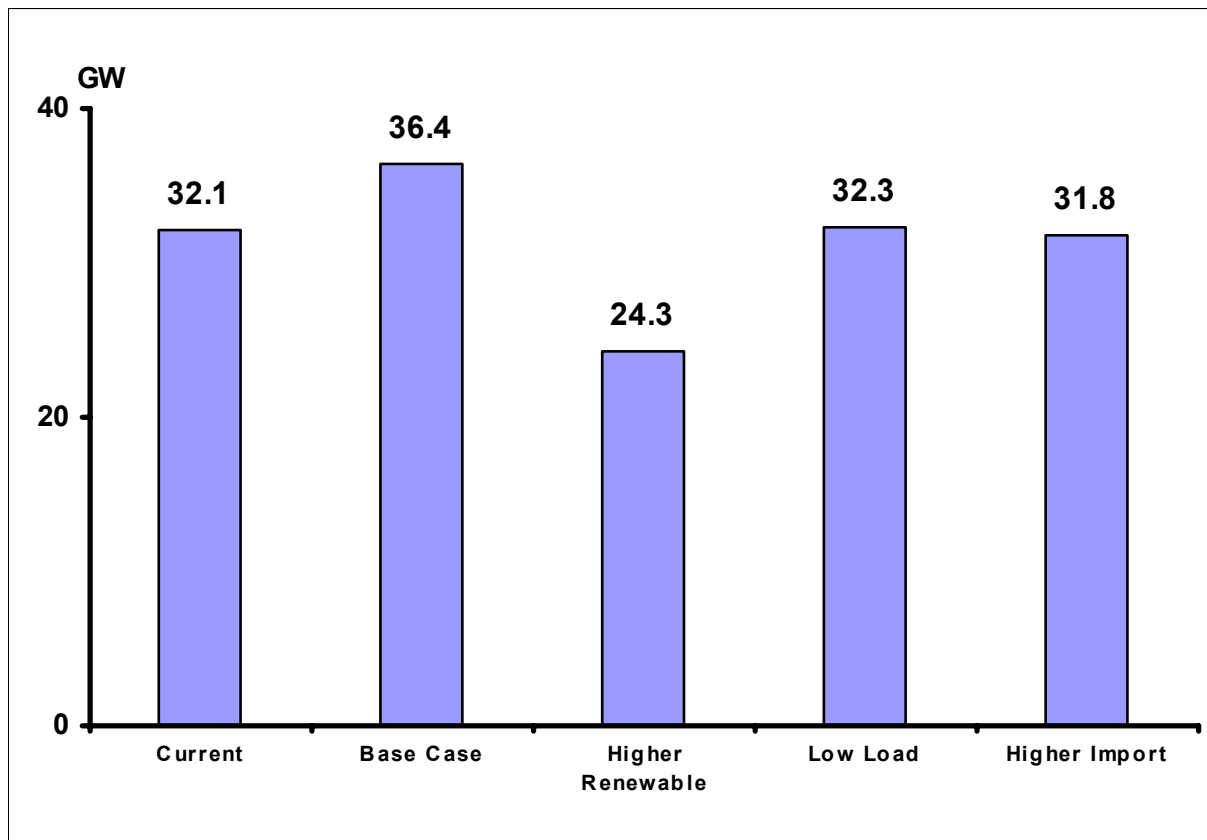
Alternative Scenarios – Summary Assessment

| | Demand Growth %/Year | Peak Demand GW | Capacity Need GW | Gas Capacity GW | Renewables GW | Imports GW |
|---------------------------------|----------------------------|----------------------|---------------------|-----------------------|------------------|---------------|
| Current | - | 52 | 60 | 32.1 | 4.4 | 18.2 |
| Base Case | 1.5 | 80 | 92 | 36.4 | 18.3 | 26.5 |
| Higher Renewables @ 33% | 1.5 | 80 | 92 | 24.3 | 30.4 | 26.5 |
| Low Load Growth | 1.0 | 73.5 | 84.5 | 32.3 | 16.8 | 24.3 |
| Higher Imports @ 30% of peak | 1.5 | 80 | 92 | 31.8 | 18.3 | 31.7 |

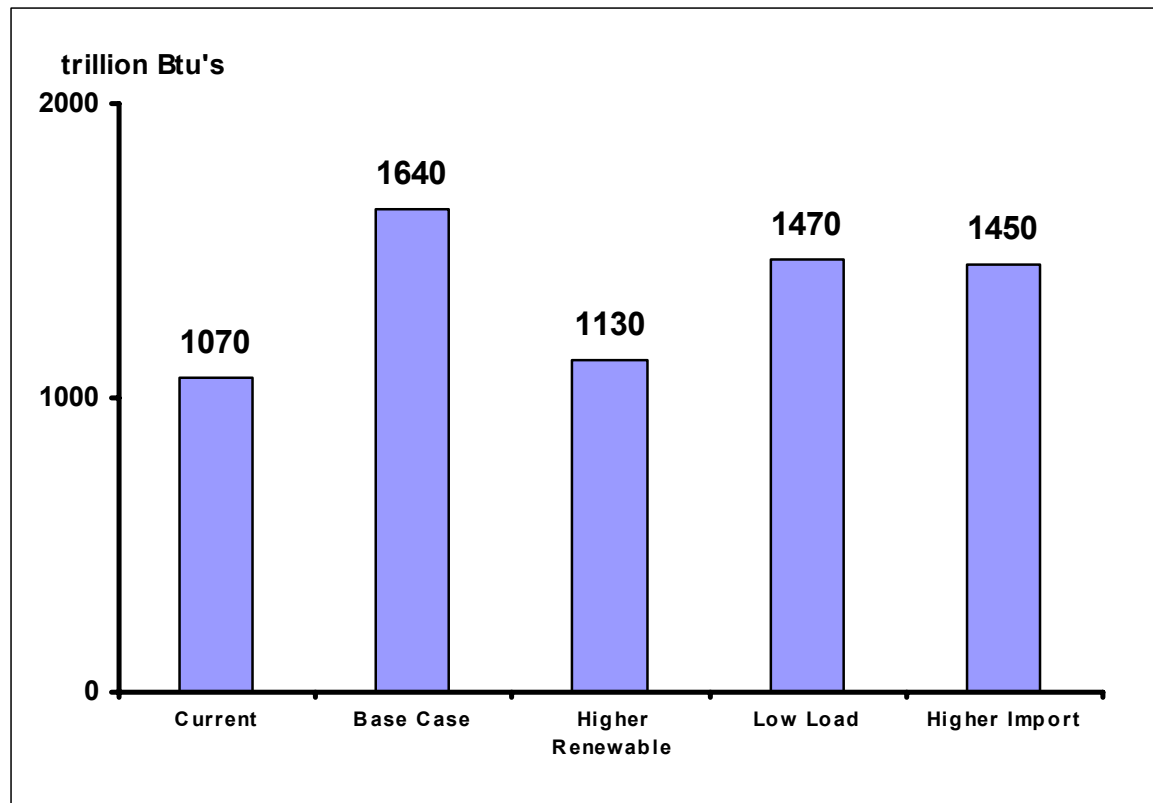
Assessment of Scenarios

- Gas-fueled generation capacity
- Natural gas requirements
- Renewables capacity
- Transmission interconnections

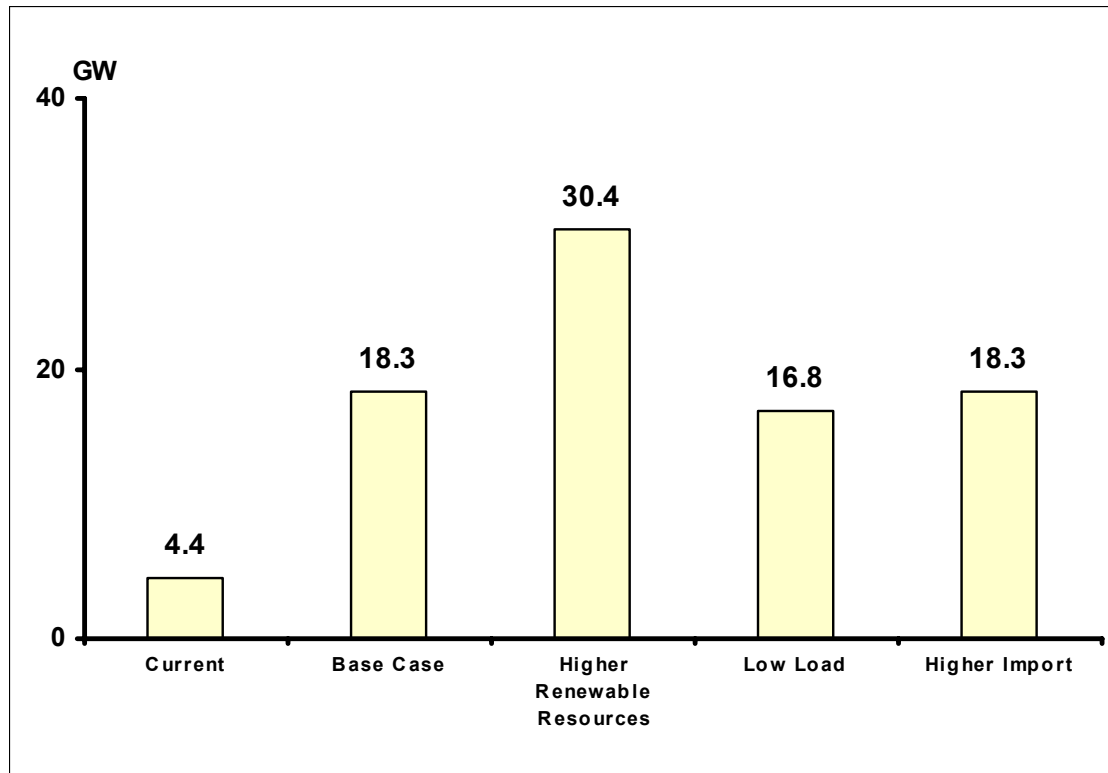
Gas Fueled Generation Capacity – Current and for 2030 Under Different Scenarios



Gas Fuel Requirements – Current and for 2030 Under Different Scenarios

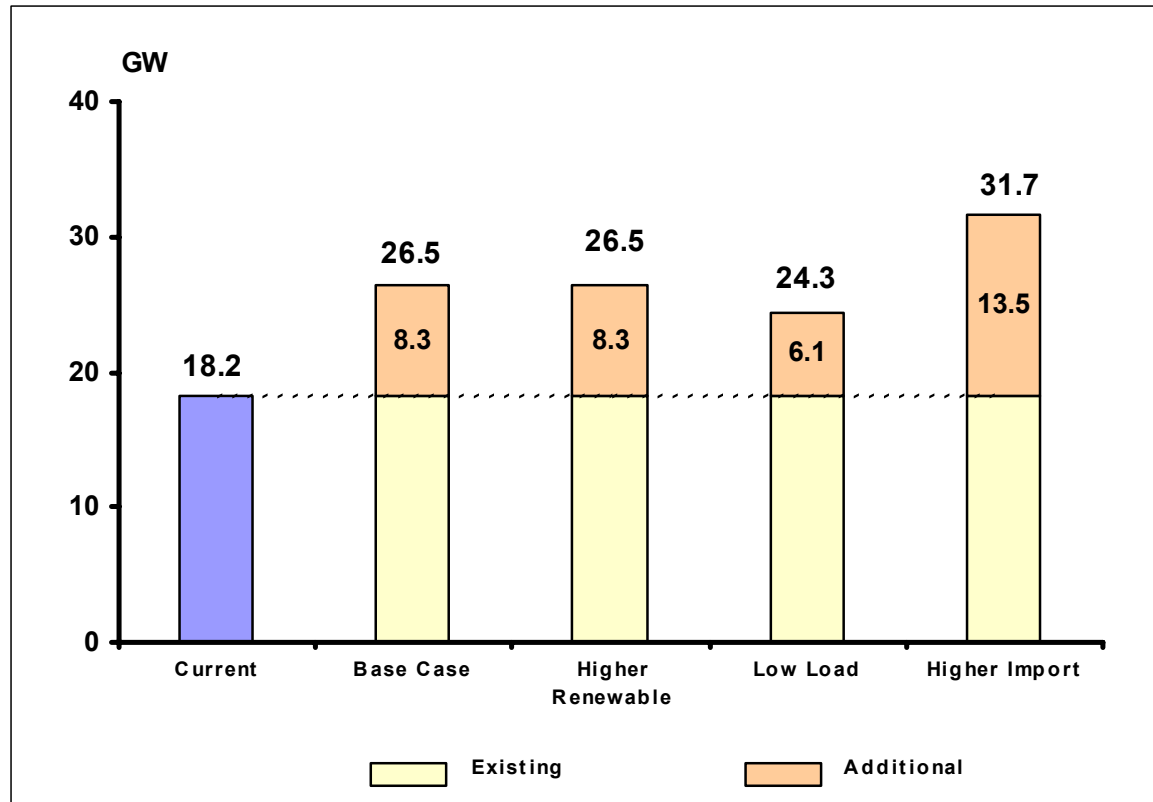


*Renewable Capacity Under Different Scenarios**



*Firm On-Peak Capacity. Due to intermittent nature of renewable resources, actual installed capacity is estimated to be two to three times the amount of renewable firm on-peak capacity required.

Transmission Interconnection Capacity Under Different Scenarios



Policy Issues & Recommendations for Planning California's Future Transmission Interconnections

- Planning for transmission interconnections requires a long term horizon.
- Transmission planning and valuation methodologies need to be reevaluated to incorporate long term and strategic benefits in decision-making.
- California should develop a unified vision and strategic plan for future interconnections and work with neighboring states to plan new interconnections, rights-of-ways and corridors, and streamline siting and permitting for multi-state projects.
- California should segment interconnection planning process into a strategic and a permitting phase.

Policy Issues & Recommendations for Planning California's Future Transmission Interconnections – Cont'd

The strategic phase should be designed to:

- Focus on a 25-year planning horizon.
- Build consensus on the need for interconnections.
- Assess resource potential and market hubs to identify potential interconnection projects.
- Work with neighboring states to build consensus on interconnections, corridors and projects.

The permitting phase should be designed to:

- Focus on specific projects needed in the next 5 to 10 year window.
- Streamline assessment of need.
- Establish valuation methodologies that address strategic and insurance value of transmission.